MITSUBISHI ELECTRIC RESEARCH LABORATORIES
Cambridge, Massachusetts

I Can’t Even Program My VCR and They Just Keep Throwing More Complicated Stuff at Me!

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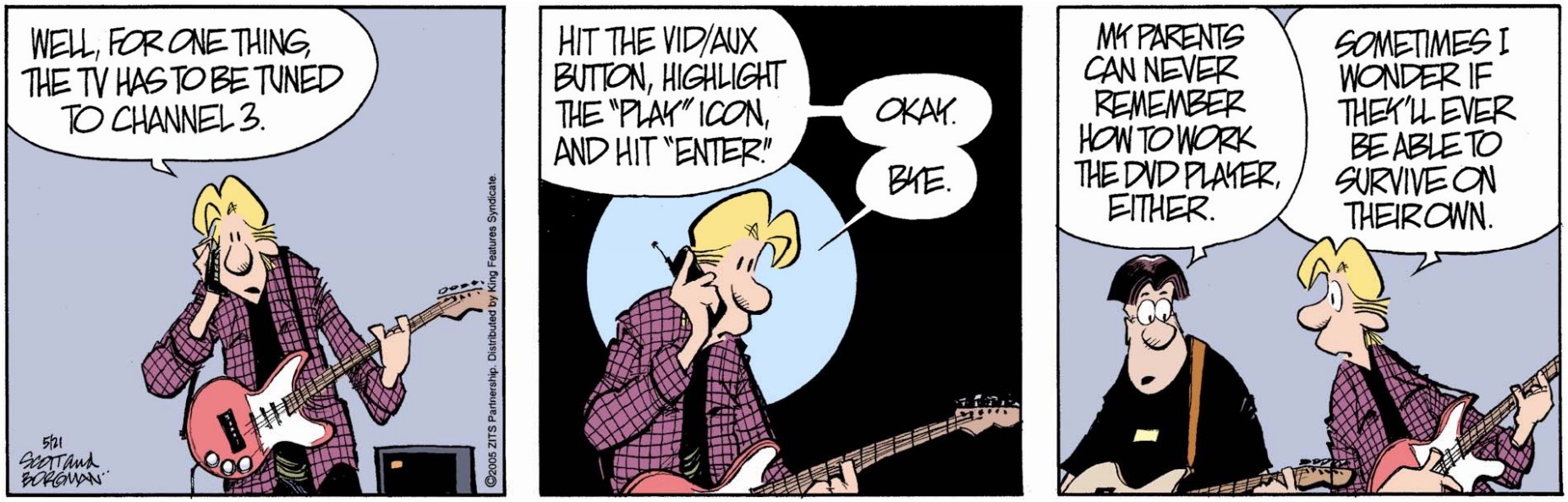
The Problem We Are Addressing:


WELL, FOR ONE THING, THE TV HAS TO BE TUNED TO CHANNEL 3.
5/21
SCOTT and BORGMAN
©2005 ZITS Partnership. Distributed by King Features Syndicate.
HIT THE VID/AUX BUTTON, HIGHLIGHT THE "PLAY" ICON, AND HIT "ENTER."
OKAY.
BYE.
MY PARENTS CAN NEVER REMEMBER HOW TO WORK THE DVD PLAYER, EITHER.
SOMETIMES I WONDER IF THEY'LL EVER BE ABLE TO SURVIVE ON THEIR OWN.

Is There Really a Problem?

"... [it has become] painfully obvious that the promise of the digital revolution to make our lives easier, simpler, better, is not being delivered. In fact, in many respects, it's only made life more complicated. And we are to blame."

Gerard Kleisterlee
CEO, Royal Philips Electronics
Speech at Consumer Electronics Show, Las Vegas, 2004

Reported in Newsweek, October 18, 2004, page E8.

A “Dual Use” Problem?

- The operational complexity of many high-tech home products now rivals many military sub-systems, such as a sonar monitoring, ammunition loading control, or flight path entry.

- Just like civilians, soldiers are often called on to use system features with which they are not familiar, because:

(1) The feature is only seldom used in general

(2) The usual operator is not available due to injury, etc.

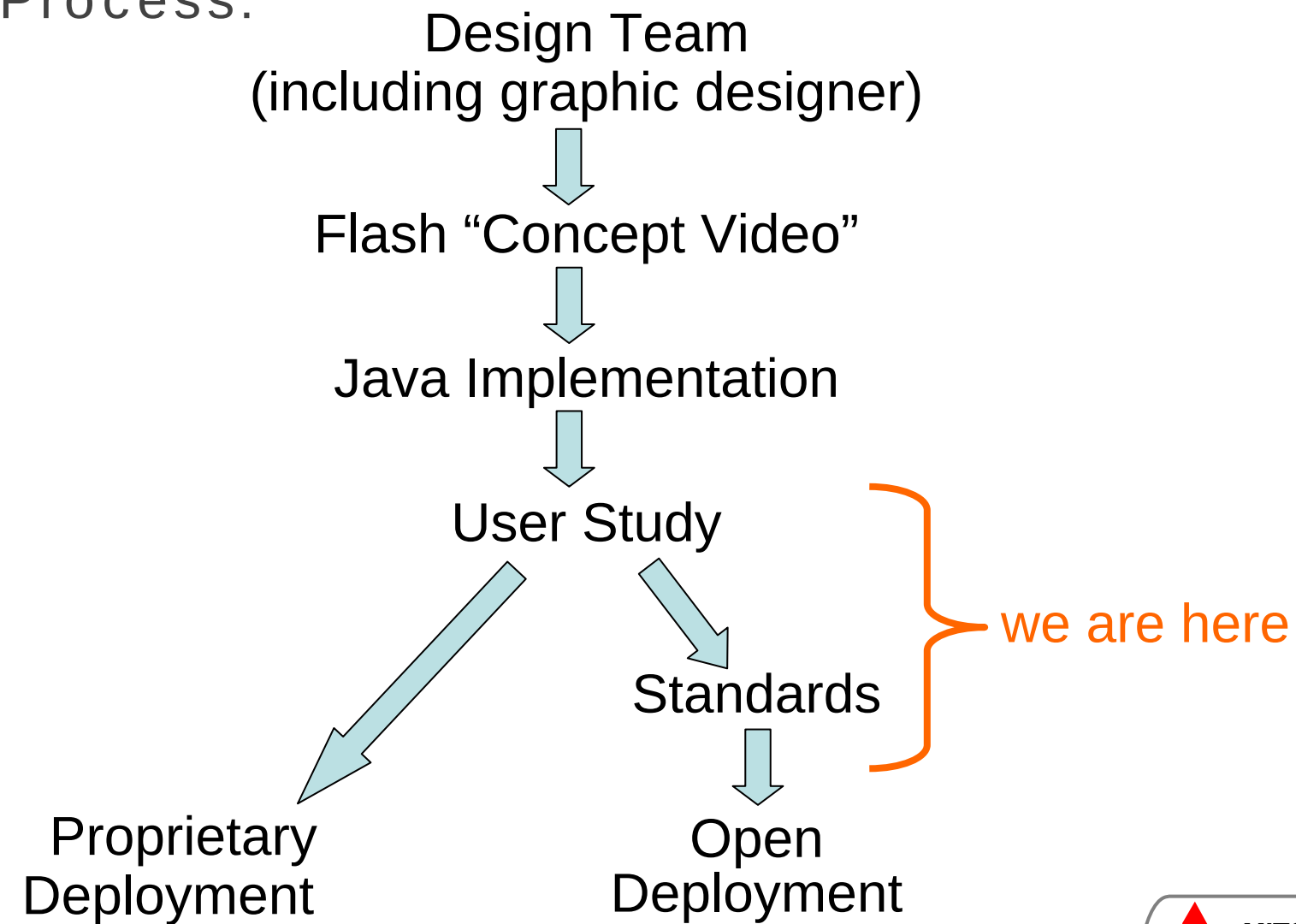
(3) One soldier is responsible for operating many sub-systems
(due to the general trend toward reduced crew sizes)

Concept Video

(10 Minutes)

- *audience*
- *proprietary -> open*
- *dual use*

R & D Process:

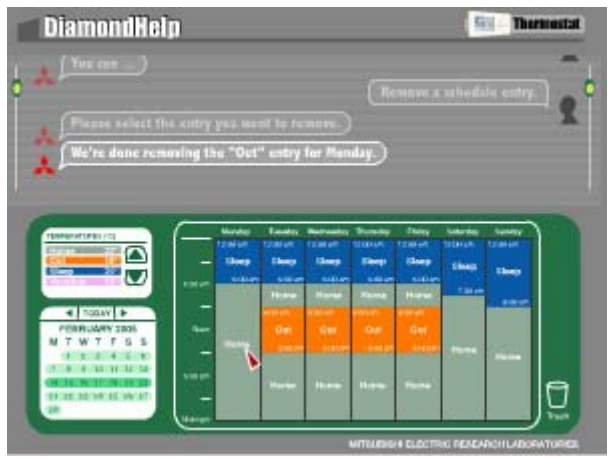

Design Team
(including graphic designer)
Flash “Concept Video”
Java Implementation
User Study
Standards
we are here
Proprietary
Deployment
Open
Deployment

Interaction Design Features

Separation of Simple and Complex Functions

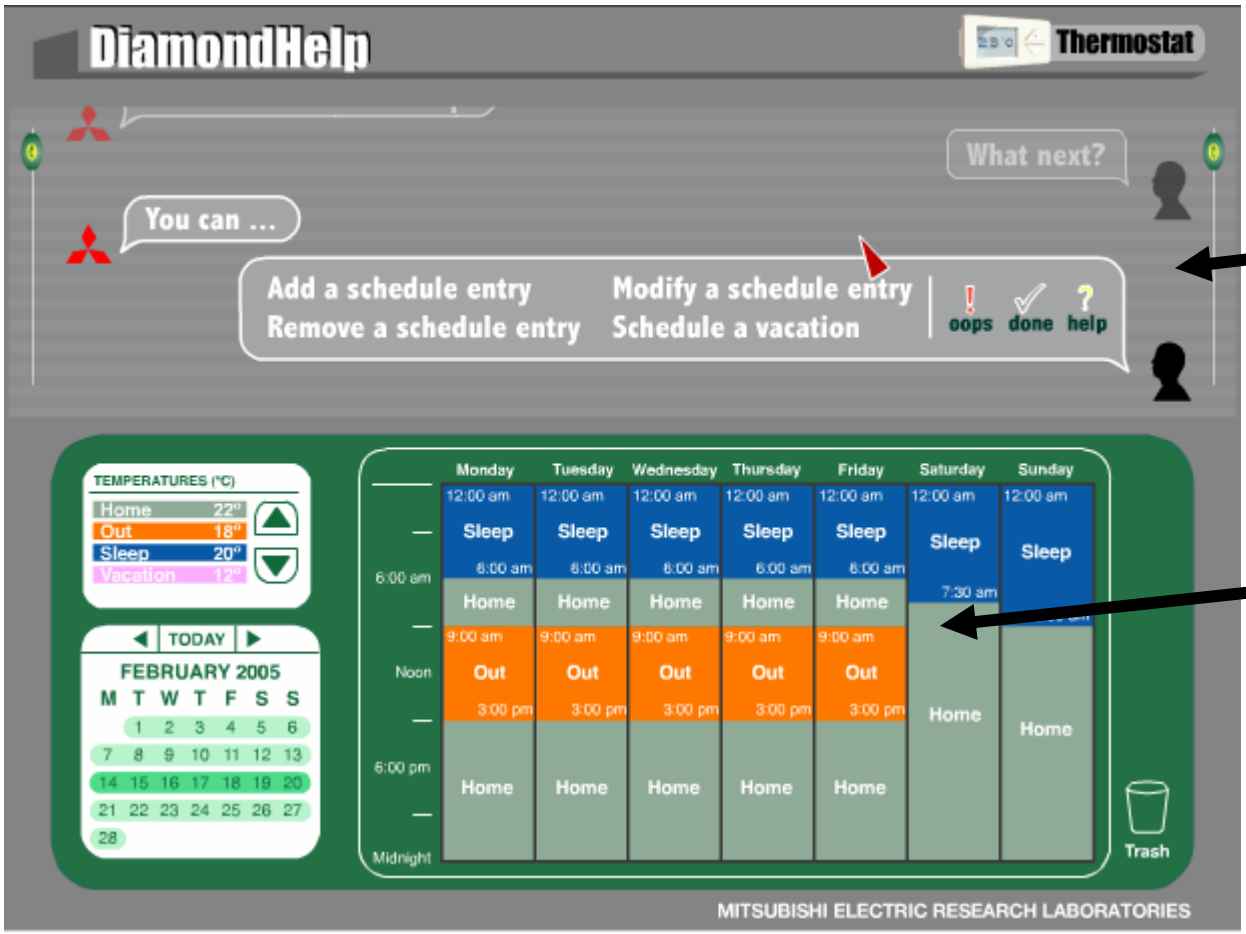
- A design methodology
- Analyze the use of each product:
  - identify commonly used functions (typically simple, immediate operations) and put them on the device itself
  - put all the other functions (typically complex, occasionally used programming and customization) on a shared resource, i.e., the DiamondHelp station

simple functions



complex functions

Unique Combination of Conversational and Direct Manipulation Interaction:



conversational area (same for every product)

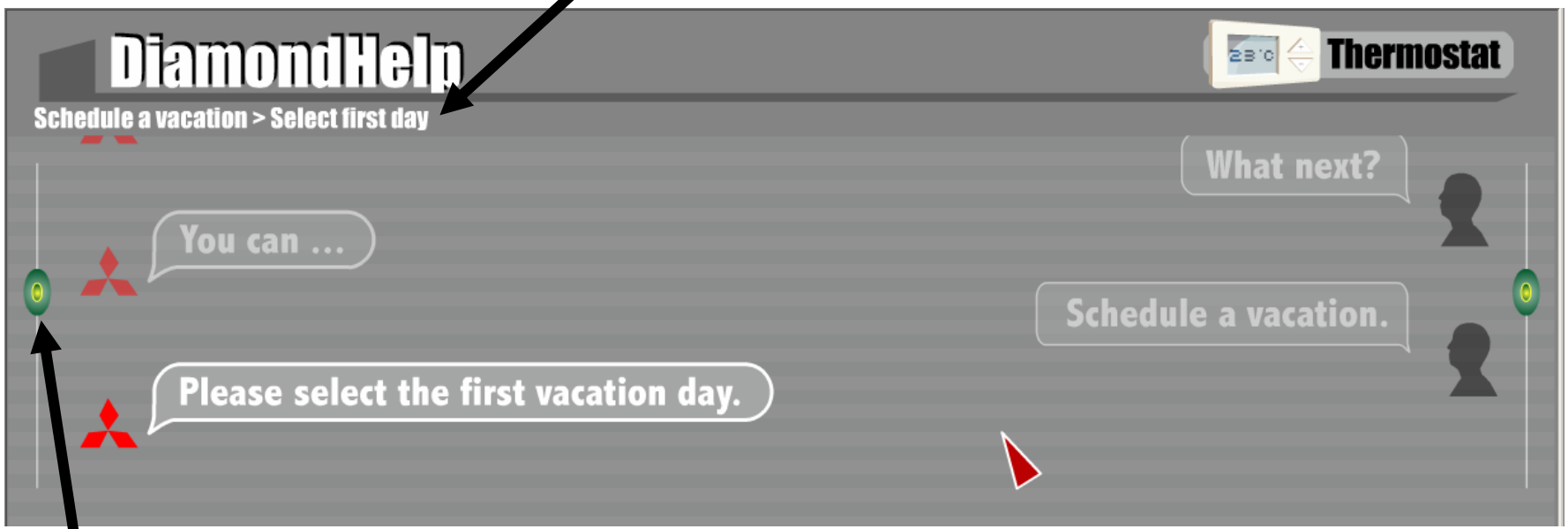
direct manipulation area (different for each product)

Principles of Collaborative Interaction:

- Task/Goal oriented
  - system knows the user's *goal* at every point
  - either because user explicitly stated goal or system automatically recognized it
- Mixed initiative
  - user can work by him/herself (via direct manipulation interface)
  - or let system give step-by-step instructions (via conversational interface)
  - can freely shift initiative back and forth depending on task/sub-task
- Contextualized guidance
  - user can always ask "What next?" and get contextualized guidance

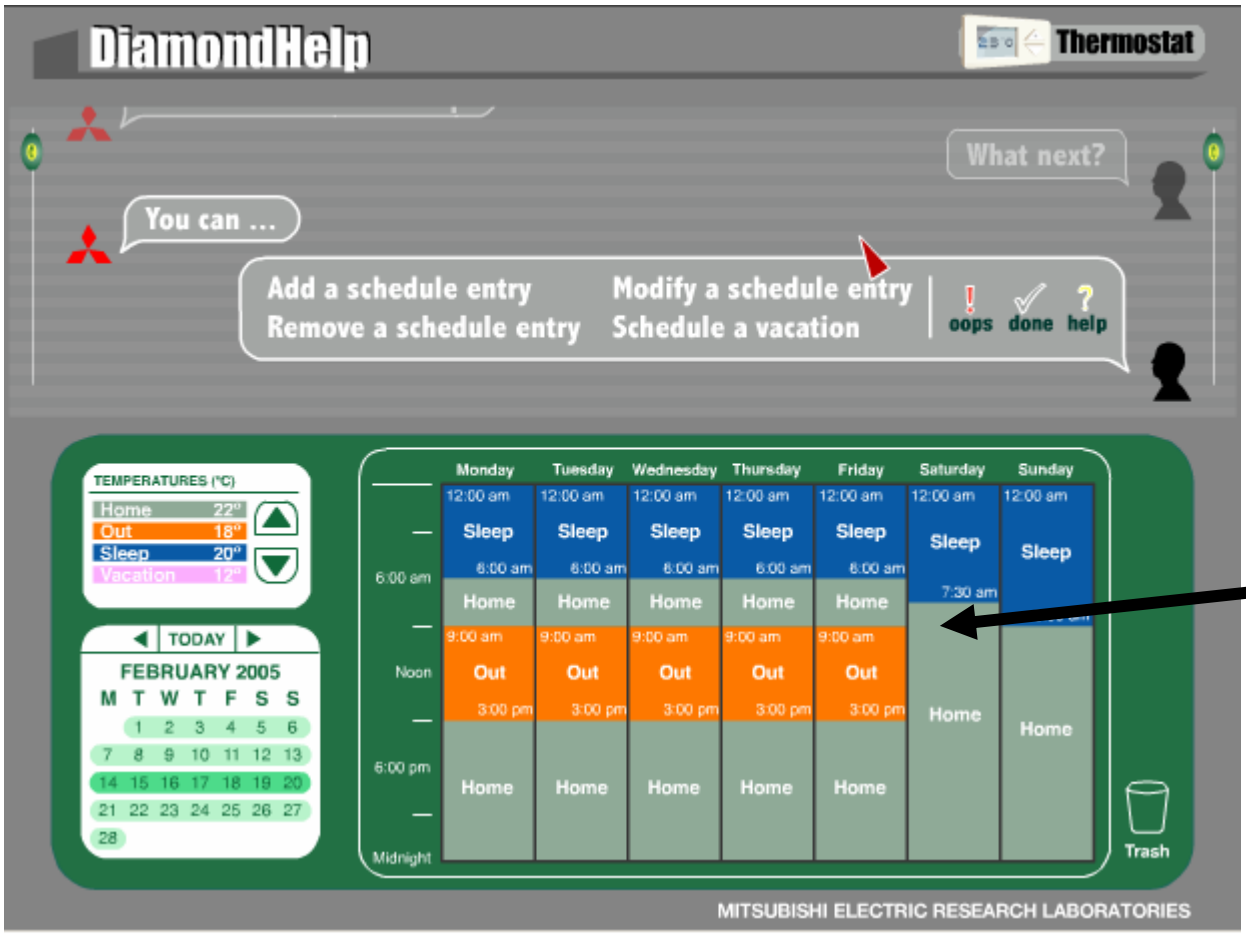
Task/Goal Oriented:

Task Bar **tells you what goal you are currently working on**



Conversational History **lets you scroll back and look at earlier parts of conversation (e.g., explanations from DiamondHelp)**

Mixed Initiative:

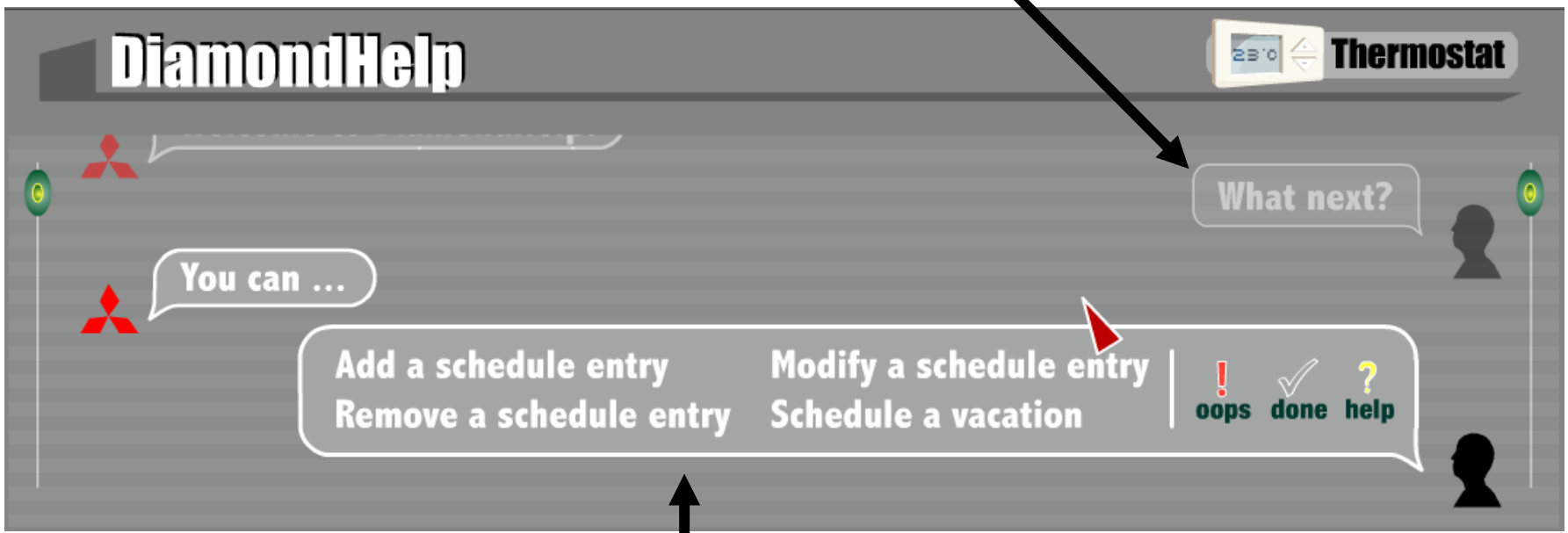


Unlike traditional pop-up dialogue windows, the direct manipulation area is ***never*** "locked."

User is ***always*** free to do what he wants.

Contextualized Guidance:

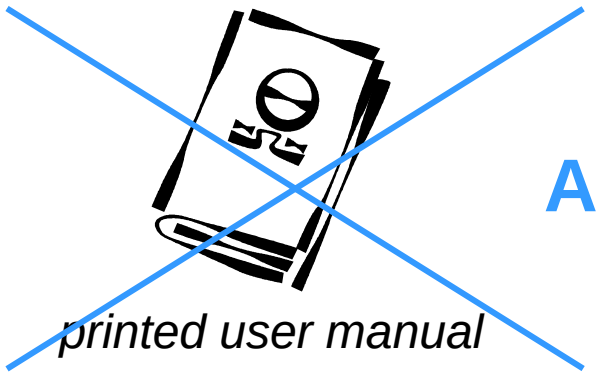
If you are lost, you can always ask "What next?" to get guidance from DiamondHelp



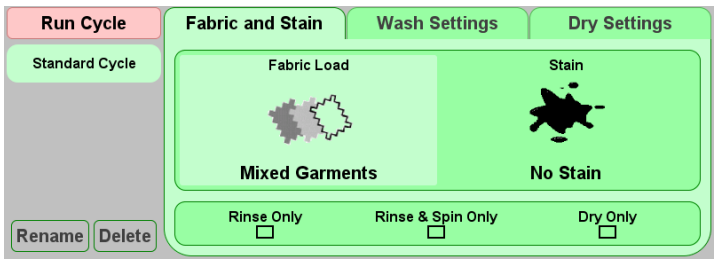
System presents top-level goals or next steps in current task

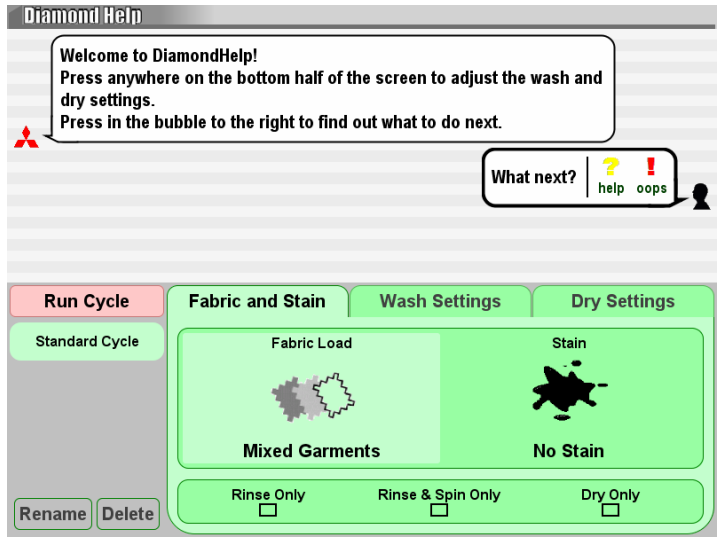
User Study (Planned)

A **vs.** **B**



A’





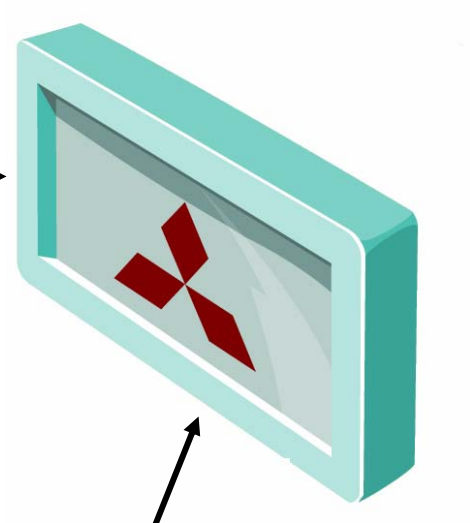
Assign complex tasks which require using advanced features of interface

Architecture

"Plug and Play" Architecture

DiamondHelp Plugin

via internet, CD, hardware plugin, etc.

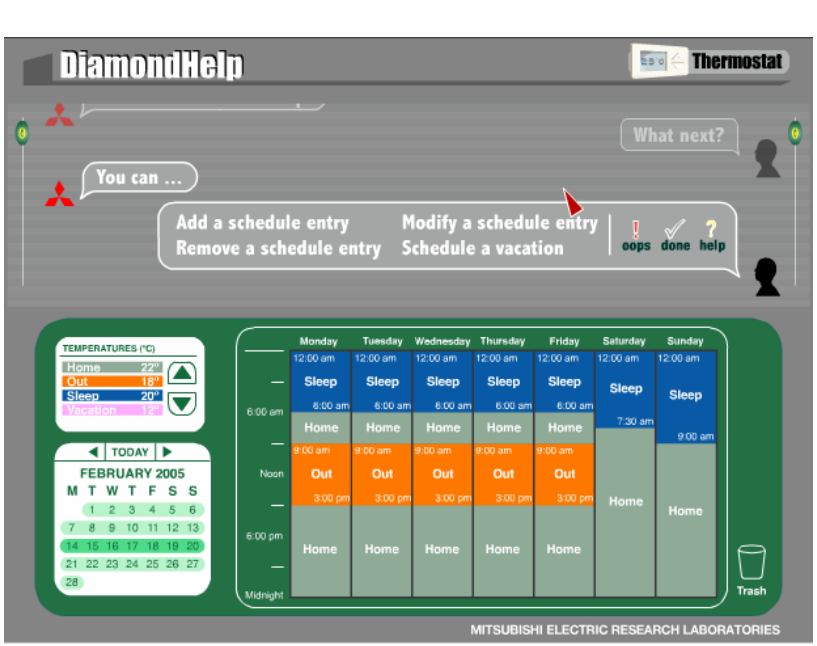


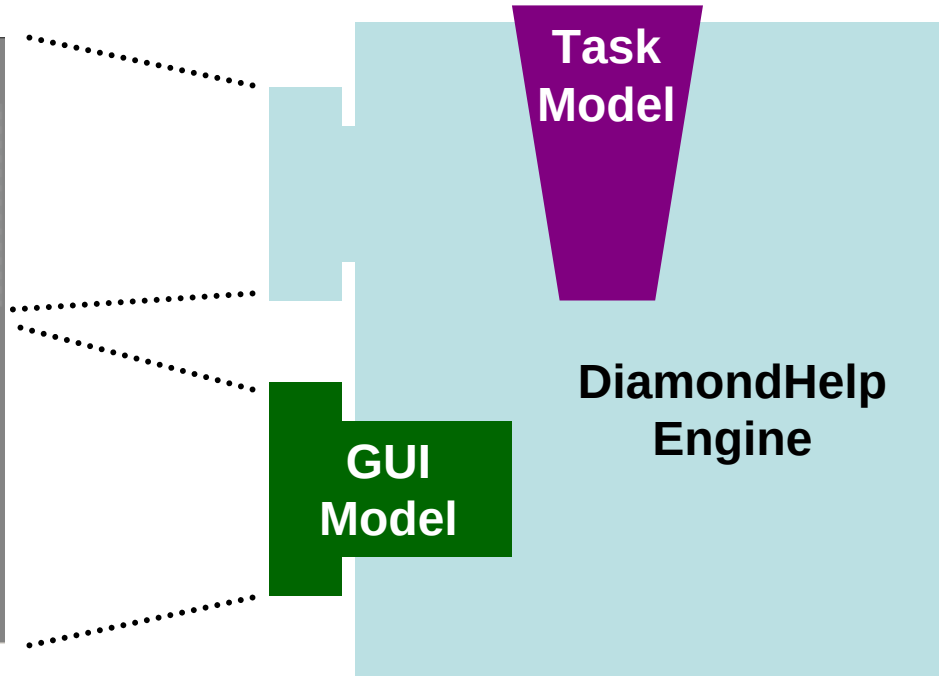
home network

- *discovery*
- *description*
- *upload/download state*

Product Manufacturer

"Plug and Play" Architecture



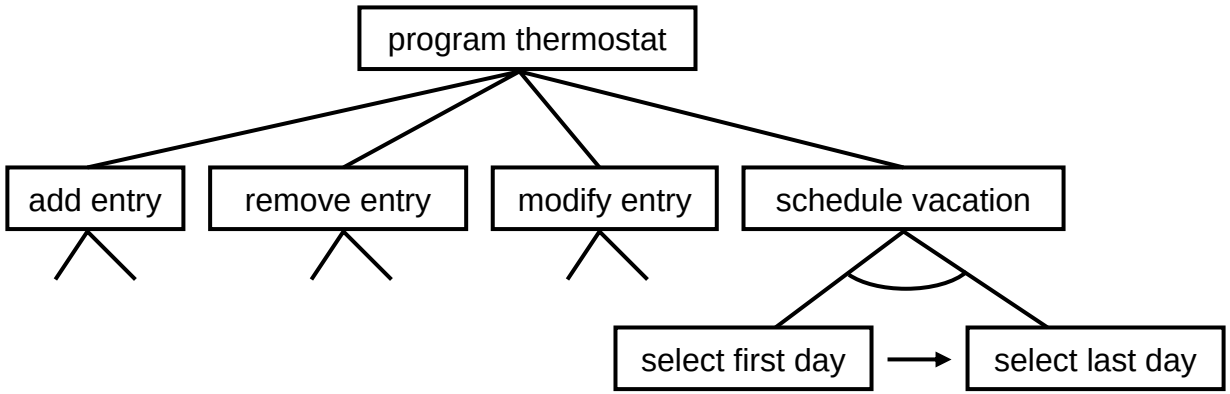


DiamondHelp plugin for each product has two components:

- GUI Model – manages bottom half of screen (direct manipulation interface)
  – reports user GUI actions to DiamondHelp engine
  – provides API for DiamondHelp engine to change product state
- Task Model – used by DiamondHelp engine to manage top half (chat window)

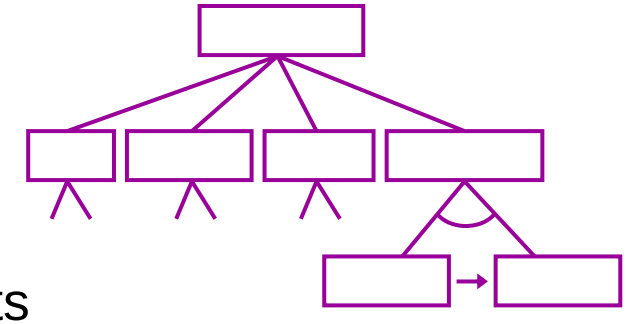
Architecture: Task Model

Task Model



- an abstract, hierarchical representation of the actions typically performed to achieve goals in the application domain
- actions may be ordered or unordered
- includes explanatory documentation, e.g., to answer help questions
- encoded in xml by product manufacturer
- task model is *not* the same as the menu structure (see next slide)

Architecture: COLLAGEN



- Java middleware for **COLL**aborative **AGEN**ts
- Developed at MERL over past 10 years
- The “interpreter” for task models in DiamondHelp:
  - computes ***task context*** by tracking user’s progress through task model (plan recognition)
  - computes ***system response*** (utterance or action) based on current task context
  - computes ***user menu*** (e.g., answer to “What next?”) based on current task context

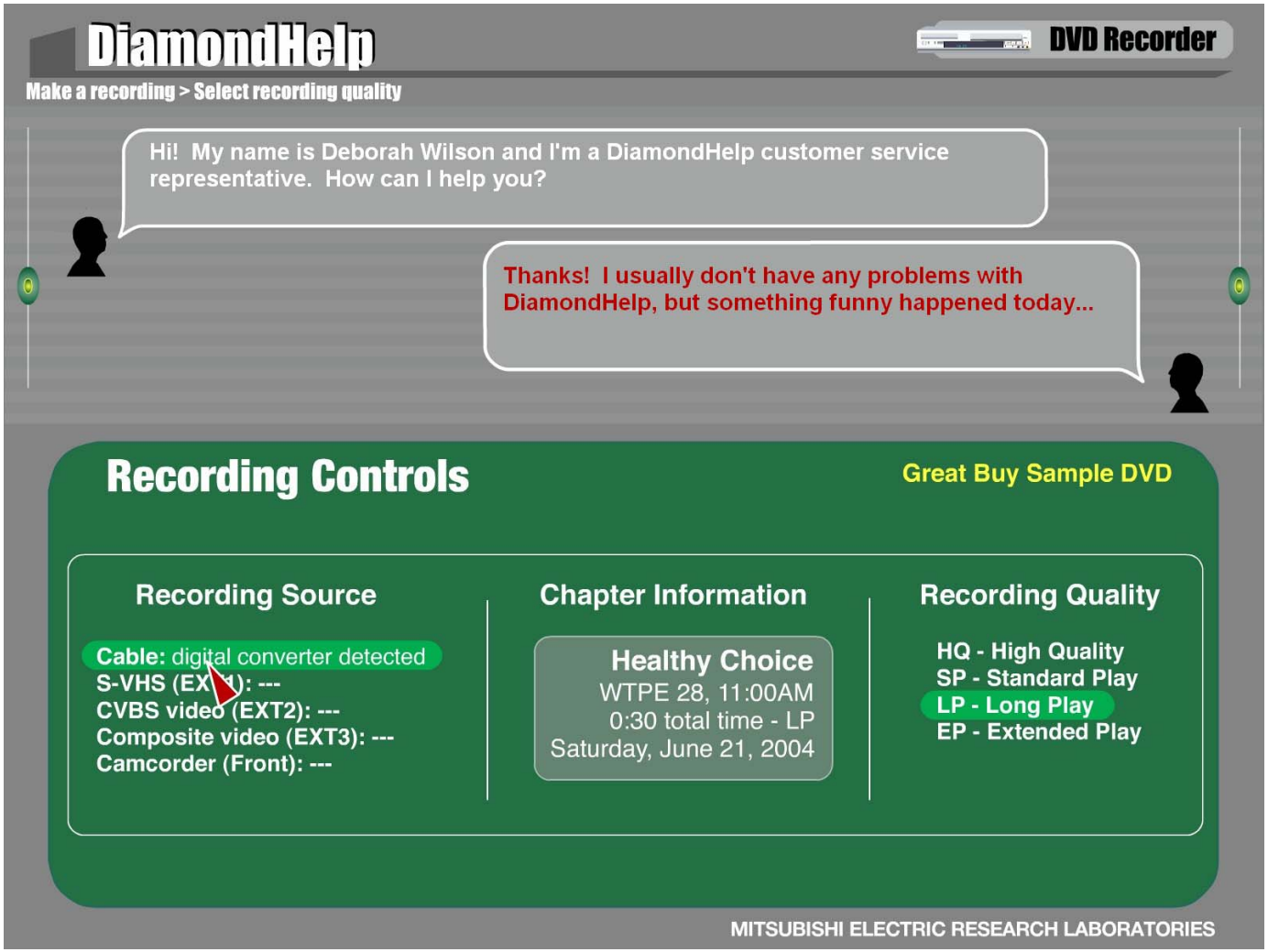
Extensions and Variations

Extensions and Variations: Speech

- Text-to-Speech
  - could be very pleasant for DiamondHelp side of conversation
  - many off-the-shelf text-to-speech engines available
  - will be included in live demo today

- Speech Recognition
  - to recognize what user says to system
  - more difficult technically (open microphone issues, etc.)
  - recognition is made easier due to limited interface choices

Extensions and Variations: Live Web Chat


DiamondHelp
DVD Recorder
Make a recording > Select recording quality
Hi! My name is Deborah Wilson and I'm a DiamondHelp customer service representative. How can I help you?
Thanks! I usually don't have any problems with DiamondHelp, but something funny happened today...
Recording Controls
Great Buy Sample DVD
Recording Source
Cable: digital converter detected
S-VHS (EXT1): ---
CVBS video (EXT2): ---
Composite video (EXT3): ---
Camcorder (Front): ---
Chapter Information
Healthy Choice
WTPE 28, 11:00AM
0:30 total time - LP
Saturday, June 21, 2004
Recording Quality
HQ - High Quality
SP - Standard Play
LP - Long Play
EP - Extended Play
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- *Chat with a real person using same interface (requires keyboard)*
- *Remote operator shares same bottom window to view and modify appliance state*

Extensions and Variations: Other Functions

- Family Calendar
  - generalization of “vacation” mode
  - record scheduled activities of family members (school, work, exercise, party, etc.) in DiamondHelp calendar
  - automatically adjust all appliances in house based on family’s activities in calendar
- Energy Saving
  - DiamondHelp makes it easier to accurately schedule appliance on/off times
  - reduce “standby” power consumption by turning off everything in applicance except network interface

Extensions and Variations: Other Functions

- Appliance Troubleshooting and Repair
  - DiamondHelp can also help you when appliance malfunctions
  - help with diagnosis and repair
  - contact repair center via web

- “Aging at Home”
  - special adaptations of DiamondHelp station for elderly
  - integration with other home monitoring and safety systems
  - user interfaces for medical instrumention

Extensions and Variations: Other Applications

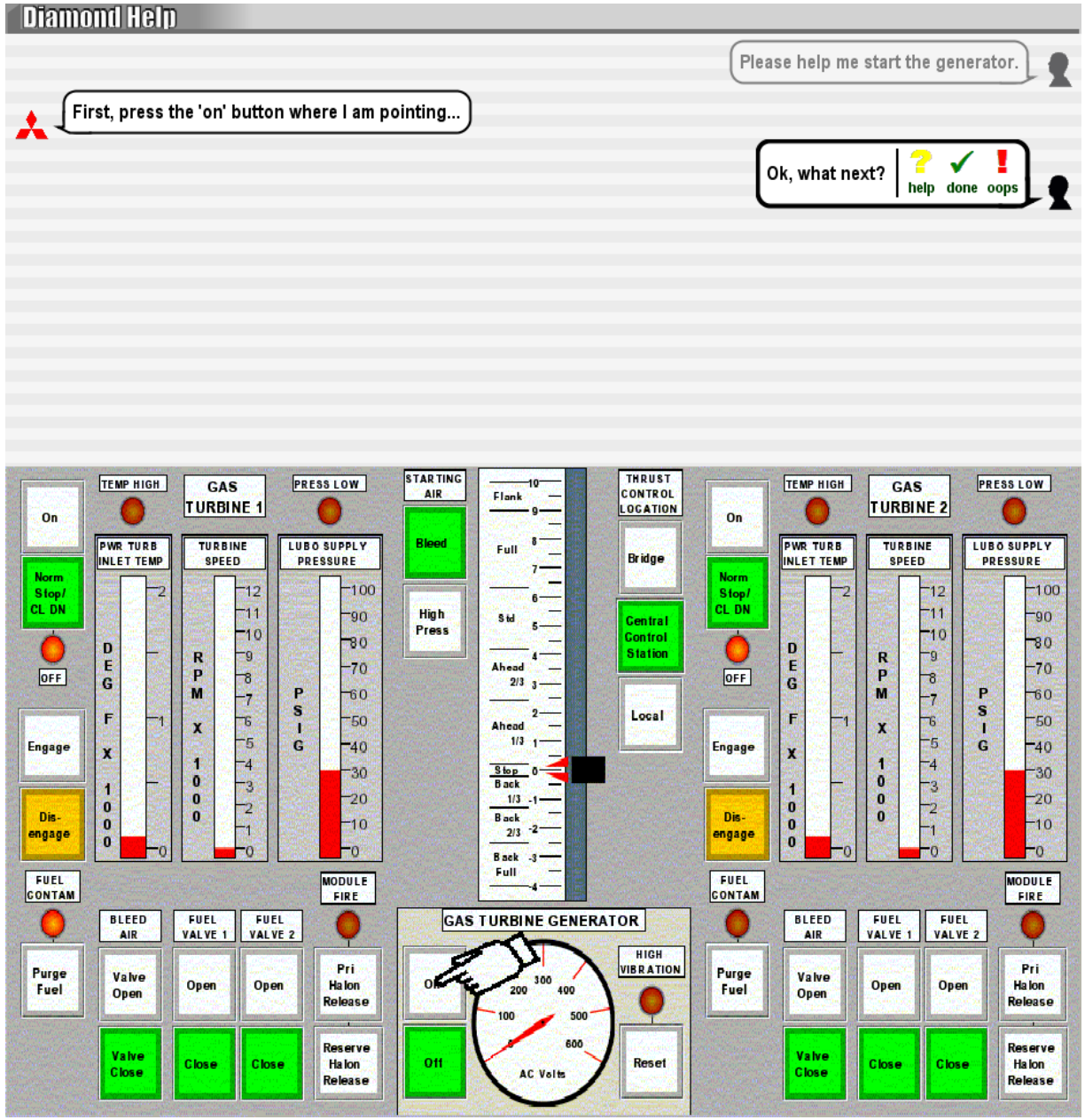
- Industrial Applications
  - similar interface can be applied to intelligent building control, factory automation, and other industrial applications

- Government & Military Applications
  - may therefore be very amenable to homeland security and military applications
  - including (simulator-based) training

Simulator-Based Training Systems

For example, imagine help with the complex startup procedures for a naval gas turbine engine…

(mockup shown at right)



Other Collaborative Interfaces for Appliances

- Collaborative interfaces, similar to DiamondHelp, for home appliances are currently found only in university research, e.g.,

  http://www.io.tudelft.nl/research/intelligentproducts

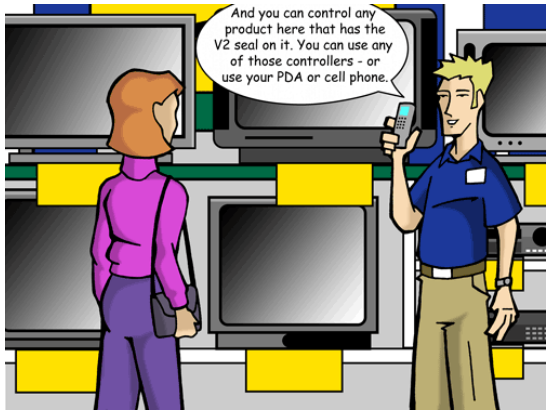
  "the product is seen as a partner which collaborates and helps the user work on a task or reach a certain goal"

- Or in small startup companies, e.g.,

  http://www.personica.com

  "natural interfaces and intelligent assistant technology for the digital home"

Relevant Standards: ANSI 389-2005 to 393-2005


And you can control any product here that has the V2 seal on it. You can use any of those controllers - or use your PDA or cell phone.

"Universal Remote Console"

Protocol to Facilitate Operation of Information and Electronic Products through Remote and Alternative Interfaces and Intelligent Agents.

"... to facilitate development and deployment of a wide variety of devices (from different manufacturers) that can act as Universal Remote Consoles for an equally varied range of target devices and services, also from different manufacturers."

International version currently under development as ISO 24752 (under IEC JTC1 SC35).

See http://www.myurc.com

Live Demo

(followed by question period)